PHYTOPHAGOUS INSECT FAUNA OF TWO WEEDS, *HYPTIS SUAVEOLENS* (L.) POIT. AND *JATROPHA GOSSYPIFOLIA* L., IN AUSTRALIA'S NORTHERN TERRITORY

Colin G. Wilson

Parks and Wildlife Commission of the Northern Territory, PO Box 496, Palmerston, NT 0831

Abstract

The phytophagous insect fauna of the exotic weeds *Hyptis suaveolens* (L.) Poit. (Lamiaceae) and *Jatropha gossypifolia* L. (Euphorbiaceae) are recorded for the Northern Territory, Australia. Six species were found feeding on *H. suaveolens* and one on *J. gossypifolia.* Both plant species have been colonised by far fewer insects than other exotic weeds of similar size, geographic range and time since introduction.

Introduction

Hyptis suaveolens (L.) Poit. (Lamiaceae) and *Jatropha gossypifolia* L. (Euphorbiaceae) are plants of tropical American origin now widespread in northern Australia (Parsons and Cuthbertson 1992). *H. suaveolens,* an erect, annual, woody-based herb with a strong aromatic smell, was reported in Australia at Port Essington on the north coast by the explorer and botanist Ludwig Leichhardt in 1845 (Bentham 1870). *J. gossypifolia*, a perennial, woody subshrub, was probably introduced deliberately to northern Australia some time last century as an ornamental or medicinal plant (Pitt and Miller, in press). Its features include thick, soft, sappy stems, glossy green or reddish-purple leaves divided into three or five lobes and the presence of numerous branched, sticky, glandular hairs on leaf margins and petioles.

Although morphologically and taxonomically distinct, both species have been used to treat a wide variety of ailments and conditions in traditional medicine throughout the world, from the common cold to cancer (Chopra *et al.* 1956; Irvine 1961; Morton 1981; Schultes 1987; Uphof 1968).

Of greater interest to this study, however, is that both species have reputed insecticidal properties. Pittier (1942) suggested that *H. suaveolens* might have some use as an insecticide and extracts of the plant have since been found to kill mosquito larvae (Sharma *et al.* 1992) and mites (Cervancia and Aspiras 1987). Branches of *H. suaveolens* are used under beds and chairs to deter bedbugs in the Philippines (Uphof 1968) and Timor (I. Wayan Mudita, personal communication). Prasad *et al.* (1993) referred to insecticidal properties of *J. gossypifolia*, and Chatterjee *et al.* (1980) found that the seeds contained toxic principles that acted as contact insecticides. According to Raina and Gaikwad (1987), infestations of *J. gossypifolia* in India are completely free of any visible fungal or insect damage.

H. suaveolens has been a candidate for biological control in the Northern Territory since 1979 and natural enemies with potential for use in such a project have been found in tropical America (I. W. Forno, personal communication) although their host range has not been studied. *J. gossypifolia* is a potential target for a biological control project in northern Australia and Indonesia. As part of the preliminary studies on these weeds in

Australia prior to introduction of agents for biological control, their acquired phytophagous insect faunas were identified. The results of these studies are reported here.

Materials and Methods

Between 1984 and 1987, immature and mature phytophagous insects were handpicked or aspirated from seedlings and mature plants of *H. suaveolens* and *J. gossypifolia* whenever they were found. Flowers, fruit, leaves, stems and roots were all examined carefully for signs of insect herbivory. Damage was correlated wherever possible to the species and stages of insects present. Only insects which fed on living tissues of the plants in question were included in the phytophagous insect faunas. Insects resting but not feeding on the plant species were not included. Immature insects were reared on excised plant material in the laboratory and adults determined.

H. suaveolens is probably the most widespread and abundant exotic plant in the monsoonal regions of the Northern Territory, and plants were searched opportunistically on more than one hundred occasions during daylight hours and in every month of the year, but more often between December and April when most rain occurs. Areas near Darwin were searched more frequently, but the search area extended from the Calvert River near the Queensland border to the Victoria River near the Western Australian border. *J. gossypifolia* plants were searched on five occasions at Tipperary Station, 150 km south of Darwin, on three occasions at Willeroo Station, 125 km south west of Katherine, and once at Daly Waters. At least 1 h was spent collecting on each occasion.

Results

Hyptis suaveolens

A total of six species of phytophagous insects, representing two orders and five families, was found feeding on *H. suaveolens* in the Northern Territory (Table 1). Only one, the major agricultural pest species *Helicoverpa armigera* Hübner (Zalucki *et al.* 1986), was common. All fed externally on the plant and nymphs or larvae of four species were collected on the plant and reared. Four of the insects are polyphagous, feeding on plants in more than one family. No seed-, flower- or root-feeding species were found.

A parasitoid, *Goniophthalmus* sp. (Diptera: Tachinidae), was reared on several occasions from pupae of *H. armigera*.

Jatropha gossypifolia

Only one species of phytophagous insect was found feeding on *J. gossypifolia* in the Northern Territory, the leaf-mining gracillariid moth *Epicephala* sp. (Table 1). It was collected on each search of plants at Tipperary and Willeroo Stations.

Table 1. Phytophagous insects associated with *Hyptis suaveolens* and *Jatropha gossypifolia* in the Northern Territory.

Insect	Host plant[a]	Stages collected[b]	Associated plant parts[c]	Host relationship[d]	Host specificity[e]
HEMIPTERA					
Dictyopharidae					
Dictyophara australiaca (Lallemand)	H	A	St	ECT	?
Lygaeidae					
Graptostethus pubescens Slater	H	A	Fr	ECT	P
Pentatomidae					
Spermatodes australis (Schouteden)	H	A, N	St	ECT	P
LEPIDOPTERA					
Gracillariidae					
Epicephala sp.	J	L, P	Le	END	?
Noctuidae					
Earias smaragdina Butler	H	L	Le	ECT	P
Helicoverpa armigera (Hübner)	H	L	Fr , Le	ECT	P, E
Pyralidae					
'*Pyrausta*' *phoenicalis* (Hübner)	H	L	Le	ECT	?

(a) H, *Hyptis suaveolens*; J, *Jatropha gossypifolia*.

(b) L, larva; N, nymph; P, pupa; A, adult.

(c) Fr, fruit; Le, leaf; St, stem.

(d) ECT, ectophagous; END, endophagous.

(e) P, polyphagous, known from other plant families; ?, host range not known; E, economic pest.

Elasmus formosus Girault (Hymenoptera: Elasmidae) was reared on several occasions as a larval ectoparasitoid of *Epicephala* sp.

Discussion

When a plant species invades a new geographic region, it draws colonists rapidly and asymptotically from the local pool of endemic insects (Strong 1974; Strong *et al.* 1977). The number of insect species which utilise the exotic weed will normally be determined by the presence of related native plant species (Connor *et al.* 1980; McCoy and Rey 1983), the architectural complexity of the plant (Lawton and Schroeder 1977; Strong and Levin 1979), and by the geographic area occupied (Connor and McCoy 1979).

Both *H. suaveolens* and *J. gossypifolia* are in families well represented in northern Australia. The range of *H. suaveolens* in the Northern Territory overlaps that of at least seven genera of native plants in the same family (Lamiaceae), while *J. gossypifolia* overlaps with dozens of genera and species of Euphorbiaceae (Dunlop 1987). *H. suaveolens* is abundant across northern Australia with a local history extending back at least 150 years. *J. gossypifolia* was planted as an ornamental around many Station homesteads last century, but is abundant at only a few locations in the Northern Territory, including a single stand of over 700 ha on Willeroo Station (Pitt and Miller, in press).

Given the presence of many related native plant species within the ranges of these weeds in Australia, their widespread distributions and relative abundances, their architectural complexity offering many feeding sites, and the length of time available for recruitment of colonists, these two species are remarkable for the absence of diverse phytophagous insect faunas. This becomes even more apparent when one compares them with other exotic weeds in the Northern Territory.

Sida acuta Burm. f. and *S. cordifolia* L. (Malvaceae), two weeds of tropical American origin with similar morphology, distribution and phenology to *H. suaveolens*, have 20 and 23 insect colonists recorded respectively in the Northern Territory (Wilson and Flanagan 1990) compared to *H. suaveolens* with only six, one of which, *Helicoverpa armigera*, is extremely polyphagous, having been recorded feeding on 75 plant species in 29 families (Zalucki *et al.* 1986), nearly all of them exotic. Another, '*Pyrausta*' *phoenicalis* (Hübner), was also recorded as a natural enemy of *H. suaveolens* in Mexico (J. D. Gillett, personal communication), and hence may itself be an immigrant to Australia.

Xanthium occidentale Bertoloni (Asteraceae), a North American plant species known in Australia as Noogoora burr, is an annual shrub similar in size and structure to *J. gossypifolia*. It is probably more widely distributed in the Northern Territory than *J. gossypifolia* but is an annual species. *X. occidentale* has accumulated 50 species of phytophagous insects (Wilson and Flanagan 1993) compared to just one found on *J. gossypifolia*.

H. suaveolens and *J. gossypifolia* are barely utilised by native phytophagous insects in Australia despite ample opportunity for their recruitment. It appears that the lack of phytophagous insects on these weeds cannot be explained solely in terms of architectural complexity and geographic area occupied. Other similar introduced weeds with these factors in common have accumulated far more insect colonists over a similar time span than *H. suaveolens* and *J. gossypifolia*. I suggest there is some substance to reports that both plant species have insecticidal properties.

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